

Make an infrared webcam

If you're in the dark about capturing footage at night, customise your webcam. Chris Finnamore explains how to enhance your night vision without eating any carrots

A webcam is a cheap way of getting video on to your PC, whether you want a basic CCTV system or simply a way of monitoring a location, such as your garden. Unfortunately, as soon as the lights go out at night, your average webcam is no use at all.

If you are interested in night-time shooting and you don't have the money to splash out on a fancy model with a low-light or infrared shooting mode, read on. We'll show you how to convert a standard webcam into an infrared one using cheap and readily available components, thus enabling you to shoot video and capture CCTV footage all through the night. You can use it to keep an eye on the local wildlife. Animals such as foxes rarely risk venturing out during the day, but if you leave an infrared webcam running at night you might be able to catch their nocturnal wanderings and feeding habits.

WHAT YOU NEED

Just as a normal camera needs a visible light source, infrared cameras need an infrared light source. However, as infrared light is invisible to the naked eye, you can fill a room or your garden with light without thieves or wildlife noticing.

Before you get started, there are a few things you need to know. First, webcams come with an infrared filter. This filter prevents infrared light, which is produced by sunlight, and tungsten and halogen bulbs, among other things, interfering with the camera's focus and colour. As we want a camera that can see in

infrared, you need a webcam that allows this filter to be removed. There's no hard and fast rule for which cameras can be converted; we tried with a Logitech camera, but the filter was glued to the lens. But we had success with Creative's VF-0060 (£60 including VAT from www.dabs.com), which has a removable filter.

You need to exclude all light except infrared so you must make a filter. For this you can use a strip of fully exposed (dark) film negatives, which you'll find if you look at the negatives of your holiday snaps. If you don't have any, your local photo shop might be kind enough to give you some. Finally, we made an infrared light source using a set of infrared light-emitting diodes (LEDs) and an AA battery pack, so we could use the camera at night when there are no natural sources of infrared light. The components cost around £10 including VAT from www.maplin.co.uk. If you're not handy with a soldering iron, you can buy Sony's HVLIRM Infrared Nightshot Light for £50 including VAT from www.electronics-online.co.uk.

One word of warning: once you convert a webcam to work in infrared, it will never again work with natural light. If used in sunlight you'll see only the infrared parts of the spectrum.

GETTING STARTED

1 Undo the screws that hold the webcam together; there are usually a couple hidden in recesses. Carefully prise the webcam apart using a small flat-head screwdriver. Most webcams are held together by clips and should come apart fairly easily. If there is significant resistance, have a look for any screws you might have missed.

2 When you have access to the webcam's insides, you will see the lens assembly attached to the webcam's circuit board. Unscrew the lens and look for the infrared filter. This will be behind the lens, in front of the CMOS sensor. Although it can look clear, it has a red tint when it catches the light.

3 Depending on the webcam, the filter will be held in by the casing or by a screw-down collar. If the filter is held in by the casing, use a knife to carefully prise the filter free. Otherwise, unscrew the collar, and the filter should pop out easily.

4 Our visible light filter is made using two bits of negative, one on top of each other. The size of the filter will depend on where you mount it. It has to be mounted between the lens and the charge-coupled device (CCD), which is the shiny chip mounted on the circuit board. Depending on your camera, you may have to mount it behind the lens using Superglue or Blu Tack. Don't use plastic glue or you'll melt the negatives. Cut your filter to cover the entire lens.

Alternatively, as with our camera, you can unscrew the lens assembly by removing the circuit board, cut two bits of negative that fit inside the rectangular recess of the assembly and mount the filter on top of

FAQ

Q If I catch a burglar on my home webcam, will the footage be admissible in court?

A If you are the victim of a break-in but you are lucky enough to catch the thief on camera, you might be able to use your footage to help secure a conviction. First, showing the police the footage could help them find a suspect to arrest. Second, while the footage might not be enough to prove the suspect's guilt, the webcam's images can be used in court to help the prosecution's case. However, there is a certain quality threshold that must be passed before camera footage can be used in court, so the clearer your webcam's picture, the better chance you have.

As yet there is no precedent in English law regarding using a home webcam as a security device, but in 2005 one did help to catch a Cambridge burglar. The burglar's movement triggered the camera and it took several pictures, which the police used to identify and arrest the thief.

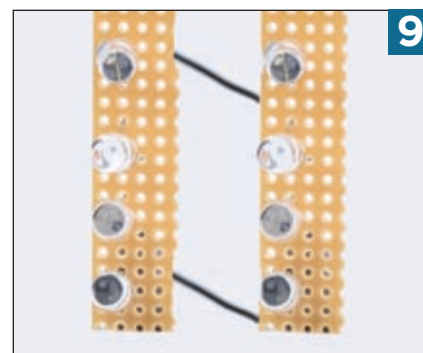
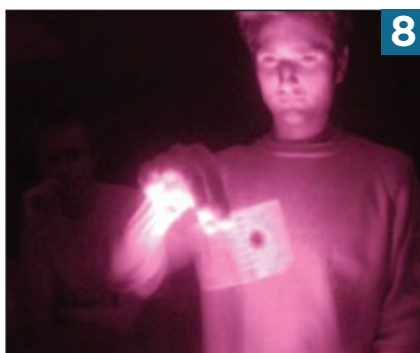
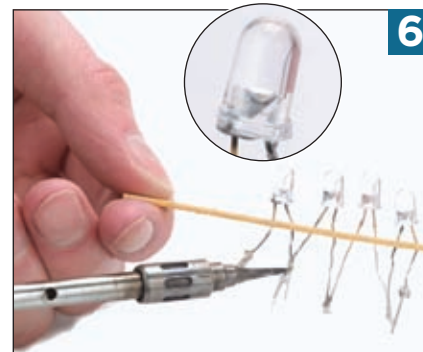
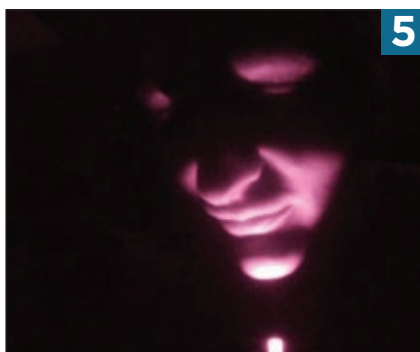
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▲ Mount the webcam, infrared light and power on top of your monitor to keep an eye on your PC at night



the CCD. Screwing the lens assembly back into place holds the filter securely.

5 Reassemble the webcam. It will now be sensitive only to infrared light. Plug your webcam into your PC to test it. Whether or not you see a picture depends on what kind of ambient light you have. Lights with halogen or tungsten bulbs produce infrared light, so under these lights you will see an infrared image in your webcam software. If you have only fluorescent bulbs, the screen will be almost black as fluorescent bulbs give off little infrared light. Don't worry, you can see if your webcam works by holding down a button on a remote control to provide infrared light.

6 There is not much point in having an infrared webcam if you're going to leave the lights on. We also need to build an infrared light source for the webcam. LEDs that emit infrared light instead of visible light are normally used to build remote controls, but several grouped together make an effective infrared light source. They cost 57p each from Maplin Electronics (www.maplin.co.uk).

Group your LEDs together on a pin board to make them easy to wire together. Each LED draws 1.7 volts, so four AA batteries are sufficient to power four LEDs in series. As LEDs are diodes, you have to wire them the correct way round, or

they won't work and could burn out. The longer of the LED's legs is the positive terminal. You can also tell by looking at the inside of the LED: the positive leg is connected to the smaller part of the diode.

Position the positive leg of the first LED at the top of the pin board and put the other three below it in the same orientation, so each LED's positive leg can be connected to the negative leg of the previous LED. Solder each positive leg to each negative leg.

7 To supply the LEDs with power, you need four AA batteries connected together in series. The easiest way to do this is to use a battery box that is already wired together correctly. Solder a wire to the positive terminal and another, approximately twice as long, to the negative.

You also need to wire a switch between the battery pack and the LEDs so you can turn the infrared light off during the day. Take the positive wire from the battery pack and solder it to either one of the toggle switch's terminals. After that, solder another wire of the same length to the other terminal.

8 To complete the circuit, solder the spare wire from the toggle switch to the positive leg of the LED at the top of the pin board. Solder the long wire connected to the battery box's

negative terminal to the negative leg of the bottom LED. Turn on the switch and turn off your normal lights to see the infrared image.

9 If you want to light a larger room, you'll need more than four LEDs. So far, we have wired four LEDs in series, and this arrangement needs the maximum voltage our battery pack can supply. To add more LEDs, we must wire them in parallel with our current array.

To do this, put another four LEDs in your pin board in the same configuration as before and solder them together as described in Step 6. Solder another wire to the positive leg of the top LED in the first array and connect it to the positive leg of the top LED in the next array. Do the same for the negative legs of the bottom LEDs. You can repeat the process for however many sets of LEDs you would like to add to your infrared light source.

If you're planning to leave your webcam on every night, you might want to replace the AA battery pack with a mains-to-6V DC converter. **CS**

Next Month

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